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tissue scaffold polylactide fibers base flocked

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[Green Plastics: An Introduction to the New Science of ...](#) - Stevens - Cited by 44

[PDF] **RR503 An inventory of fibres to classify their potential hazard ...**

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A whole new production technology for **fibres based** on bioengineering is also being developed. .... and artificial **tissue scaffolds** (Lee et al., 2002). ...

[www.hse.gov.uk/research/rrpdf/rr503.pdf](http://www.hse.gov.uk/research/rrpdf/rr503.pdf) - [Similar pages](#)

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**Based** on the findings, it can be concluded that NaOH improved **fiber** regularity .... with the goal of creating a **scaffolding** material for artery replacement. ...

[lgu.umd.edu/lgu\\_v2/homepages/saes.cfm?trackID=393](http://lgu.umd.edu/lgu_v2/homepages/saes.cfm?trackID=393) - 126k - [Cached](#) - [Similar pages](#)

[PDF] **Progress report 2000**

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Calibration of the "Flock of Birds". electromagnetic tracking device and ..... for use as a **scaffold in tissue-** engineering. 9e Conferentie van ...

[www.bmti.utwente.nl/library/progress\\_reports/progressreport2000.pdf](http://www.bmti.utwente.nl/library/progress_reports/progressreport2000.pdf) - [Similar pages](#)

[PDF] **Progress report**

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**Tissue Engineering and Scaffold Materials.** The central aim of **tissue** engineering, is the ..... nerve **fibers** in the spinal cord and motor cortex when ...

[www.bmti.utwente.nl/library/progress\\_reports/progressreportBME2002.pdf](http://www.bmti.utwente.nl/library/progress_reports/progressreportBME2002.pdf) - [Similar pages](#)

**Stock material or miscellaneous articles inventions 200706**

20070148397 - **Flocked** multi-colored adhesive article with bright lustered .....

20070141315 - **Metal-based** carbon **fiber** composite material and method for ...

[www.freshpatents.com/Stock-material-or-miscellaneous-articles-dt200706ntc428.php](http://www.freshpatents.com/Stock-material-or-miscellaneous-articles-dt200706ntc428.php) - 281k

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A novel type of **scaffold** for **tissue** engineering, made by **flock** technology ..... Suprathel® is a resorbable terpolymer **based**. on **polylactide**, trimethylene ...

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[PDF] **Activity Report 2006**

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of chondrocytes seeded in D **scaffolds**. **Tissue Eng** 1 : 1 1- 1 , 006 ... growth and activity of rat osteoblasts on **polylactide** membranes treated ...

[www.aofoundation.org/.../Extranet/Active/\\_att/wor/act/brochures/ARI\\_Activity-Report-](http://www.aofoundation.org/.../Extranet/Active/_att/wor/act/brochures/ARI_Activity-Report-2006.pdf)

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[PDF] **Untitled**

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Effect of mechanical strain on human tenocytes seeded on a novel **polylactide scaffold** for **tissue** engineering of ligaments. ...

[www.biomechanics.de/ufb/Publikationen/Jahresberichte/Jahresbericht-2006.pdf](http://www.biomechanics.de/ufb/Publikationen/Jahresberichte/Jahresbericht-2006.pdf) -

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bulk of a three-dimensional **tissue scaffold**. The presentation of this strategy ..... nanofiber was very stable, even when the **fibers** were shaken in glass ...

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dpa **fiber tissue** of 3-79 cotton. Sequence analysis indicated a ..... **Poly lactide** (PLA) has been melt spun to produce multifilament. continuous yarns. ...

[www.elsevier.com/homepage/sah/spd/2006sample\\_pdfs/iss2.geos/75wtab.pdf](http://www.elsevier.com/homepage/sah/spd/2006sample_pdfs/iss2.geos/75wtab.pdf) -

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<input type="checkbox"/>	L11	L10 and bone	157
<input type="checkbox"/>	L10	L9 and (base material)	197
<input type="checkbox"/>	L9	L8 and (fiber diameter)	197
<input type="checkbox"/>	L8	L7 and (fiber length)	197
<input type="checkbox"/>	L7	L6 and implant	197
<input type="checkbox"/>	L6	L5 and (cell culture)	312
<input type="checkbox"/>	L5	L4 and (collagen or polylact\$ or polycaprolact\$ or polyglycol\$ or collagen or gelatine or chitosan or hyaluron\$)	360
<input type="checkbox"/>	L4	L3 and (electrostatically flocced)	446
<input type="checkbox"/>	L3	L2 and (biodegrad\$ or resorb\$ or bioresorb\$)	17648
<input type="checkbox"/>	L2	L1 and (fiber or fibre)	117214
<input type="checkbox"/>	L1	(tissue scaffold)	603567

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NEWS	7	AUG 27	USPATOLD now available on STN
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```
=> s scaffold (tissue and cell)(w)culture
MISSING OPERATOR 'SCAFFOLD (TISSUE'
The search profile that was entered contains terms or
nested terms that are not separated by a logical operator.
```

```
=> s scaffold and (tissue and cell)(w)culture
PROXIMITY OPERATION NOT ALLOWED
Certain operators may not be nested in combination with other
operators. A nested operator is valid only when it occurs at the same
level or above the operator outside the nested phrase as determined by
the following precedence list:
```

1. Numeric
2. (W), (NOTW), (A), (NOTA)
3. (S), (NOTS)
4. (P), (NOTP)
5. (L), (NOTL)
6. AND, NOT
7. OR

For example, '(MONOCLONAL(W)ANTIBOD?)(L)ANTIGEN?' is valid since (W) is above (L) on the precedence list. However, '((THIN(W)LAYER)(L)PHOSPHOLIPID#)(A)LACTONE#' is not valid since (L)

is below (A) on the precedence list. The only exception is the 'OR' operator. This operator may be used in combination with any other operator. For example, '(ATOMIC OR NUCLEAR) (W) REACTOR' is valid.

=> s scaffold and (tissue and cell) culture  
MISSING OPERATOR CELL) CULTURE

The search profile that was entered contains terms or nested terms that are not separated by a logical operator.

=> s scaffold and (fiber# or fibre#)  
L1 10547 SCAFFOLD AND (FIBER# OR FIBRE#)

=> s l1 and (biodegrad? or resorb? or bioresorb?)  
L2 3913 L1 AND (BIODEGRAD? OR RESORB? OR BIORESORB?)

=> s l1 and (biodegrad? or resorb? or bioresorb?)  
L3 3983 L1 AND (BIODEGRAD? OR RESORB? OR BIORESORB?)

=> s l3 and (collage or hyaluron? or chitosan or gelatine or polylact? or polycaprolact? or polyhydroxybutyrat? or polyglycol?)  
L4 2960 L3 AND (COLLAGE OR HYALURON? OR CHITOSAN OR GELATINE OR POLYLACT? OR POLYCAPROLACT? OR POLYHYDROXYBUTYRAT? OR POLYGLYCOL?)

=> s l4 and (cell or tissue) and (culture or growth)  
L5 2722 L4 AND (CELL OR TISSUE) AND (CULTURE OR GROWTH)

=> s l5 and adhesive  
L6 1181 L5 AND ADHESIVE

=> s l6 and base  
L7 791 L6 AND BASE

=> s l7 and (fiber length)  
L8 11 L7 AND (FIBER LENGTH)

=> s l8 and diameter  
L9 11 L8 AND DIAMETER

=> s l9 and (mean distance)  
L10 1 L9 AND (MEAN DISTANCE)

=> d l10 1 ibib abs

L10 ANSWER 1 OF 1 USPATFULL on STN

ACCESSION NUMBER: 2004:334918 USPATFULL

TITLE: Support material for tissue engineering, for producing implants or implant materials, and an implant produced with the support material

INVENTOR(S): Offermann, Peter, Liegau-Augustusbad, GERMANY, FEDERAL REPUBLIC OF  
Worch, Hartmut, Dresden, GERMANY, FEDERAL REPUBLIC OF  
Pompe, Wolfgang, Hartha, GERMANY, FEDERAL REPUBLIC OF  
Gelinsky, Michael, Dresden, GERMANY, FEDERAL REPUBLIC OF  
Schmack, Gerhilt, Dresden, GERMANY, FEDERAL REPUBLIC OF  
Hoffmann, Gerald, Wilsdruff, GERMANY, FEDERAL REPUBLIC OF  
Kockritz, Uwe, Dresden, GERMANY, FEDERAL REPUBLIC OF  
PATENT ASSIGNEE(S): Technische Universitat Dresden, Dresden, GERMANY, FEDERAL REPUBLIC OF (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2004266000	A1	20041230

APPLICATION INFO.: US 2004-799329 A1 20040312 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	DE 2003-10312144	20030313
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Gudrun E. Hockett, Ph.D., Lonsstr. 53, Wuppertal, 42289	
NUMBER OF CLAIMS:	29	
EXEMPLARY CLAIM:	CLM-01-15	
NUMBER OF DRAWINGS:	5 Drawing Page(s)	
LINE COUNT:	797	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A scaffold for tissue culture and cell culture and for producing implant materials, in particular bone, cartilage or skin replacements or extra-corporal organ replacements or for other applications in medicine or biotechnology is made of biocompatible materials. It has at least one base material which is electrostatically flocked with fibers on at least one side. Through the electrostatic flocking the fibers are arranged almost perpendicularly on the surface of the base material and exhibits a high fiber pull-out resistance. The scaffold provides an elastic growth lattice, which is stable against compression, for cell colonization in vitro or the ingrowth of cells in vivo. Implants or implant materials can be produced with the scaffold.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

=> d 19 1-11 ibib abs

L9 ANSWER 1 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2007:291134 USPATFULL  
TITLE: COMPOSITIONS AND METHODS FOR TREATING DIVERTICULAR DISEASE  
INVENTOR(S): Hunter, William L., Vancouver, CANADA  
Toleikis, Philip M., Vancouver, CANADA  
Gravett, David M., Vancouver, CANADA  
Avelar, Rui, Vancouver, CANADA  
Guan, Dechi, Vancouver, CANADA  
PATENT ASSIGNEE(S): ANGIOTECH INTERNATIONAL AG, Zug, SWITZERLAND (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2007254833	A1	20071101
APPLICATION INFO.:	US 2007-775816	A1	20070710 (11)
RELATED APPLN. INFO.:	Continuation of Ser. No. US 2005-129763, filed on 12 May 2005, GRANTED, Pat. No. US 7241736 Continuation-in-part of Ser. No. US 2004-986230, filed on 10 Nov 2004, PENDING		

	NUMBER	DATE
PRIORITY INFORMATION:	US 2004-586861P	20040709 (60)
	US 2004-578471P	20040609 (60)
	US 2003-524023P	20031120 (60)
	US 2003-523908P	20031120 (60)
	US 2003-518785P	20031110 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	BRIAN R. WOODWORTH, 275 N. FIELD DRIVE, DEPT. NLEG BLDG H-1, LAKE FOREST, IL, 60045-2579, US	

NUMBER OF CLAIMS: 21  
EXEMPLARY CLAIM: 1  
NUMBER OF DRAWINGS: 15 Drawing Page(s)  
LINE COUNT: 18500

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Agents, compositions, and implants are provided herein for treating diverticular disease (e.g., diverticulosis and diverticulitis). In particular, fibrosis-inducing agents, hemostatic agents, and/or anti-infective agents, or compositions containing one or more of these agents are provided for use in methods for treating diverticular disease.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 2 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2007:284087 USPATFULL  
TITLE: Occlusive implant and methods for hollow anatomical structure  
INVENTOR(S): Karabey, Halil Ibrahim, San Jose, CA, UNITED STATES  
Mirizzi, Michael S., San Jose, CA, UNITED STATES  
Prestezog, Anna Grace, Sunnyvale, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2007248640	A1	20071025
APPLICATION INFO.:	US 2006-407858	A1	20060420 (11)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	APPLICATION		
LEGAL REPRESENTATIVE:	KNOBBE MARTENS OLSON & BEAR LLP, 2040 MAIN STREET, FOURTEENTH FLOOR, IRVINE, CA, 92614, US		
NUMBER OF CLAIMS:	43		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	54 Drawing Page(s)		
LINE COUNT:	3269		

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Apparatus and methods for treating a hollow anatomical structure comprises an implant sized for insertion into a hollow anatomical structure. The implant comprises a plurality of loose, bulked fibers. The fibers are formed from one or more bioabsorbable materials. Upon implantation, the apparatus causes a partial occlusion of the hollow anatomical structure, followed by a complete or substantially complete occlusion.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 3 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2006:268975 USPATFULL  
TITLE: Method and apparatus for implanting an occlusive structure  
INVENTOR(S): Mirizzi, Michael S., San Jose, CA, UNITED STATES  
Prestezog, Anna G., Sunnyvale, CA, UNITED STATES  
Karabey, Halil I., San Jose, CA, UNITED STATES  
Rodriguez, John W., San Jose, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2006229669	A1	20061012
APPLICATION INFO.:	US 2006-340183	A1	20060125 (11)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2005-647173P	20050125 (60)
	US 2005-696165P	20050701 (60)
DOCUMENT TYPE:	Utility	



FILE SEGMENT: APPLICATION  
 LEGAL REPRESENTATIVE: KNOBBE MARTENS OLSON & BEAR LLP, 2040 MAIN STREET,  
 FOURTEENTH FLOOR, IRVINE, CA, 92614, US  
 NUMBER OF CLAIMS: 15  
 EXEMPLARY CLAIM: 1  
 NUMBER OF DRAWINGS: 54 Drawing Page(s)  
 LINE COUNT: 3021

AB A method of treating a vein comprises accessing a vein at an access point spaced from a sapheno-femoral junction. A bioabsorbable fibrous body is implanted into the vein through the access point. The body is moved in the vein toward the sapheno-femoral junction.

L9 ANSWER 4 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2006:268974 USPATFULL  
 TITLE: Method and apparatus for impeding migration of an implanted occlusive structure  
 INVENTOR(S): Prestezog, Anna, Sunnyvale, CA, UNITED STATES  
 Mirizzi, Michael S., San Jose, CA, UNITED STATES  
 Karabey, Halil I., San Jose, CA, UNITED STATES  
 Rodriguez, John W., San Jose, CA, UNITED STATES  
 Thompson, Russell B., Los Altos, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2006229668	A1	20061012
APPLICATION INFO.:	US 2006-339975	A1	20060125 (11)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2005-647173P	20050125 (60)
	US 2005-696165P	20050701 (60)

DOCUMENT TYPE: Utility  
 FILE SEGMENT: APPLICATION  
 LEGAL REPRESENTATIVE: KNOBBE MARTENS OLSON & BEAR LLP, 2040 MAIN STREET,  
 FOURTEENTH FLOOR, IRVINE, CA, 92614, US

NUMBER OF CLAIMS: 18  
 EXEMPLARY CLAIM: 1  
 NUMBER OF DRAWINGS: 54 Drawing Page(s)  
 LINE COUNT: 3018

AB A method of treating a hollow anatomical structure of a patient comprises implanting a bioabsorbable fibrous body in a hollow anatomical structure. The body is secured in the hollow anatomical structure to limit migration of the body within the hollow anatomical structure.

L9 ANSWER 5 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2006:248730 USPATFULL  
 TITLE: Structures for permanent occlusion of a hollow anatomical structure  
 INVENTOR(S): Karabey, Halil I., San Jose, CA, UNITED STATES  
 Prestezog, Anna G., Sunnyvale, CA, UNITED STATES  
 Mirizzi, Michael S., San Jose, CA, UNITED STATES  
 Farley, Brian, Los Altos, CA, UNITED STATES  
 Rodriguez, John W., San Jose, CA, UNITED STATES  
 Thompson, Russell B., Los Altos, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2006212127	A1	20060921
APPLICATION INFO.:	US 2006-339978	A1	20060125 (11)

	NUMBER	DATE

PRIORITY INFORMATION: US 2005-647173P 20050125 (60)  
 US 2005-696165P 20050701 (60)  
 DOCUMENT TYPE: Utility  
 FILE SEGMENT: APPLICATION  
 LEGAL REPRESENTATIVE: KNOBBE MARTENS OLSON & BEAR LLP, 2040 MAIN STREET,  
 FOURTEENTH FLOOR, IRVINE, CA, 92614, US  
 NUMBER OF CLAIMS: 51  
 EXEMPLARY CLAIM: 1  
 NUMBER OF DRAWINGS: 54 Drawing Page(s)  
 LINE COUNT: 3096  
 AB An apparatus for treating a hollow anatomical structure comprises an  
 implant sized for insertion into a hollow anatomical structure. The  
 implant comprises a plurality of loose, bulked fibers. The  
 fibers are formed from one or more bioabsorbable materials.

L9 ANSWER 6 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2006:248658 USPATFULL  
 TITLE: Expandable occlusive structure  
 INVENTOR(S): Karabey, Halil I., San Jose, CA, UNITED STATES  
 Prestezog, Anna G., Sunnyvale, CA, UNITED STATES  
 Mirizzi, Michael S., San Jose, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2006212055	A1	20060921
APPLICATION INFO.:	US 2006-339927	A1	20060125 (11)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2005-647173P	20050125 (60)
	US 2005-696165P	20050701 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	KNOBBE MARTENS OLSON & BEAR LLP, 2040 MAIN STREET, FOURTEENTH FLOOR, IRVINE, CA, 92614, US	
NUMBER OF CLAIMS:	23	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	54 Drawing Page(s)	
LINE COUNT:	3044	
AB	An apparatus for treating a hollow anatomical structure comprises an implant comprising a plurality of bioabsorbable fibers. The implant has a compressed state in which the implant can fit within a cylindrical tube having an inside diameter of 8 French or less. The implant is expandable from the compressed state to an expanded state in which the implant has sufficient size to span the inside diameter of a cylindrical tube having an inside diameter of 12 French or greater.	

L9 ANSWER 7 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2005:318834 USPATFULL  
 TITLE: Compositions and methods for treating diverticular  
 disease  
 INVENTOR(S): Hunter, William L., Vancouver, CANADA  
 Toleikis, Philip M., Vancouver, CANADA  
 Gravett, David M., Vancouver, CANADA  
 Avelar, Rui, Vancouver, CANADA  
 PATENT ASSIGNEE(S): Angiotech International AG, Zug, SWITZERLAND (non-U.S.  
 corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2005277577	A1	20051215

APPLICATION INFO.: US 7241736 B2 20070710  
US 2005-129763 A1 20050512 (11)  
RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 2004-986230, filed  
on 10 Nov 2004, PENDING

	NUMBER	DATE
PRIORITY INFORMATION:	US 2004-586861P	20040709 (60)
	US 2004-578471P	20040609 (60)
	US 2003-523908P	20031120 (60)
	US 2003-524023P	20031120 (60)
	US 2003-518785P	20031110 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	SEED INTELLECTUAL PROPERTY LAW GROUP PLLC, 701 FIFTH AVENYUE, SUITE 6300, SEATTLE, WA, 98104-7092, US	
NUMBER OF CLAIMS:	56	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	15 Drawing Page(s)	
LINE COUNT:	10081	
CAS INDEXING IS AVAILABLE FOR THIS PATENT.		

AB Agents, compositions, and implants are provided herein for treating diverticular disease (e.g., diverticulosis and diverticulitis). In particular, fibrosis-inducing agents, hemostatic agents, and/or anti-infective agents, or compositions containing one or more of these agents are provided for use in methods for treating diverticular disease.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 8 OF 11 USPATFULL on STN  
ACCESSION NUMBER: 2005:24602 USPATFULL  
TITLE: Medical articles incorporating surface capillary  
fiber  
INVENTOR(S): Ogle, Matthew F., Cronoco, MN, UNITED STATES  
Hinnenkamp, Thomas F., White Bear Lake, MN, UNITED  
STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2005021152	A1	20050127
APPLICATION INFO.:	US 2004-781503	A1	20040218 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2003-489288P	20030722 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	PATTERSON, THUENTE, SKAAR & CHRISTENSEN, P.A., 4800 IDS CENTER, 80 SOUTH 8TH STREET, MINNEAPOLIS, MN, 55402-2100	
NUMBER OF CLAIMS:	52	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	5 Drawing Page(s)	
LINE COUNT:	1835	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Medical devices are described that comprise surface capillary (SCF) fibers, which can impart desirable properties to the devices. For example, implantable prostheses are described comprising SCF fibers. In other embodiments, catheters are described having SCF fibers along the surface of the catheters. In addition, SCF fibers can be useful for the delivery of bioactive agents in association with the fibers. Due to the fluid flow capabilities of the fibers, medical devices are described that

incorporate fiber matrices to facilitate blood delivery to cells within the structure.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 9 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2004:334918 USPATFULL

TITLE: Support material for tissue engineering, for producing implants or implant materials, and an implant produced with the support material

INVENTOR(S): Offermann, Peter, Liegau-Augustusbad, GERMANY, FEDERAL REPUBLIC OF  
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Pompe, Wolfgang, Hartha, GERMANY, FEDERAL REPUBLIC OF  
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Hoffmann, Gerald, Wilsdruff, GERMANY, FEDERAL REPUBLIC OF  
Kockritz, Uwe, Dresden, GERMANY, FEDERAL REPUBLIC OF  
PATENT ASSIGNEE(S): Technische Universitat Dresden, Dresden, GERMANY, FEDERAL REPUBLIC OF (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2004266000	A1	20041230
APPLICATION INFO.:	US 2004-799329	A1	20040312 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	DE 2003-10312144	20030313
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Gudrun E. Hockett, Ph.D., Lonsstr. 53, Wuppertal, 42289	
NUMBER OF CLAIMS:	29	
EXEMPLARY CLAIM:	CLM-01-15	
NUMBER OF DRAWINGS:	5 Drawing Page(s)	
LINE COUNT:	797	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A scaffold for tissue culture and cell culture and for producing implant materials, in particular bone, cartilage or skin replacements or extra-corporal organ replacements or for other applications in medicine or biotechnology is made of biocompatible materials. It has at least one base material which is electrostatically flocked with fibers on at least one side. Through the electrostatic flocking the fibers are arranged almost perpendicularly on the surface of the base material and exhibits a high fiber pull-out resistance. The scaffold provides an elastic growth lattice, which is stable against compression, for cell colonization in vitro or the ingrowth of cells in vivo. Implants or implant materials can be produced with the scaffold.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 10 OF 11 USPATFULL on STN

ACCESSION NUMBER: 2003:85859 USPATFULL

TITLE: Medical device

INVENTOR(S): Lahtinen, Mika, Uppsala, SWEDEN

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2003059463	A1	20030327
APPLICATION INFO.:	US 2002-149013	A1	20020924 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	SE 1999-4454	19991207
	SE 1999-4747	19991223
	SE 2000-285	20000131
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	BURNS DOANE SWECKER & MATHIS L L P, POST OFFICE BOX 1404, ALEXANDRIA, VA, 22313-1404	
NUMBER OF CLAIMS:	37	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	3 Drawing Page(s)	
LINE COUNT:	3732	
CAS INDEXING IS AVAILABLE FOR THIS PATENT.		

AB The present invention relates to a medical device with improved biological properties for an at least partial contact with blood, bodily fluids and/or tissues when introduced in a mammalian body, which device comprises a core and a nucleic acid present in a biologically compatible medium. Said nucleic acid encodes a translation or transcription product, which is capable of promoting endothelialisation in vivo at least partially on a synthetic surface of said core. The present invention also relates to a method of producing a medical device according to the invention. Further, the present invention also relates to a method of improving a mammalian, preferably human, body's biocompatibility with a synthetic surface, which method comprises introducing a device according to the invention in the body with an at least partial contact with blood, bodily fluids and/or tissues and administering a nucleic acid present in a biologically compatible medium to the surroundings thereof. Said nucleic acid encodes a translation or transcription product capable of promoting endothelialisation in vivo at least partially on said synthetic surface. The administration of nucleic acid may in alternative embodiments be performed before, simultaneously as or after the introduction of the device in a body. In addition, combinations of these embodiments are also encompassed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L9 ANSWER 11 OF 11 EPFULL COPYRIGHT 2007 EPO/FIZ KA on STN

ACCESSION NUMBER:	2000:115864 EPFULL
UPDATE DATE PUBLICAT.:	20061220
DATA UPDATE DATE:	20061220
DATA UPDATE WEEK:	200651
TITLE (ENGLISH):	MEDICAL DEVICE comprising a synthetic surface having nucleic acid for in vivo induction of its endothelialisation
TITLE (FRENCH):	DISPOSITIF MEDICAL avec une surface comprenant un acide nucleique pour induire in-vivo l'endothelialisation
TITLE (GERMAN):	MEDIZINISCHE VORRICHTUNG mit nukleinsaeurehaltiger synthetischer Oberflaeche zur in-vivo Induktion seiner Endothelialisierung
INVENTOR(S):	Lahtinen, Mika, Doebeinsgatan 2B, 752 37 Uppsala, SE
PATENT APPLICANT(S):	Xenerate AB, Uppsala Science Park, 751 83 Uppsala, SE
PATENT APPL. NUMBER:	4267190
AGENT:	Dahner, Christer, et al, Valea AB Box 7086, 103 87 Stockholm, SE
AGENT NUMBER:	87303
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LANGUAGE OF FILING:	English
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	EP 1235536	B1	20030625
DESIGNATED STATES:	WO 2001041674		20010614
	AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT		
	SE TR		
APPLICATION INFO.:	EP 2000-986137	A	20001207
	WO 2000-SE2460	A	20001207
PRIORITY INFO.:	SE 1999-4454	A	19991207
	SE 1999-4747	A	19991223
	SE 2000-285	A	20000131
CITED NON PATENT LIT.:	ERIC VAN BELLE ET AL.: 'Passivation of metallic stents after arterial gene transfer of phVEGF165 inhibits thrombus formation and intimal thickening' J. AM. COLL. CARDIOL. vol. 29, no. 6, May 1997, pages 1371 - 1379, XP002937216		
CITED PATENT LIT.:	WO 9955315	A1	
	WO 9820027	A2	

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Title:

**Bio-absorbable composite tissue scaffold**

Document Type and Number:

United States Patent 4411027

Link to this page:

<http://www.freepatentsonline.com/4411027.html>

Abstract:

The invention comprises a bio-compatible composition suitable for constructing surgical articles for the repair or replacement of a part of the body of a human or non-human animal, e.g., ligaments, tendons, bones, comprising a composite of a bio-absorbable polymer and at least one substrate of a plurality of carbon fibers.

The invention also includes surgical articles fabricated from the composites for the repair of damaged tissue, e.g., tendons, ligaments and bones.

The invention includes a method for the formation of the aforesaid composite comprising providing a substrate of the carbon fibers and providing the substrate with a continuous coating of a bio-absorbable polymer.

The invention also includes the surgical repair of a damaged body part such as a ligament, tendon or bone comprising surgically affixing to the damaged part the surgical article, the bio-absorbable polymer being absorbed by the body upon formation of the new tissue.

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06/351454

## Filing Date:

02/23/1982

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10/25/1983

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## Referenced by:

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## Assignee:

Univ, New Jersey Med (US)

## Primary Class:

623/13.180

## Other Classes:

128/DIG.008, 623/39

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***A61B17/80; A61F2/08; A61F2/30; A61L27/34; A61L27/44;  
 A61B17/00; A61F2/02; A61B17/68; A61L27/00; A61F1/00***

## Field of Search:

3/1, 3/1.9, 128/92CA, 128/92C, 128/334R, 128/335.5, 128/DIG.8,  
 427/2, 428/408, 424/125

## US Patent References:

<u>3272204</u>	September, 1966	Artandi et al.	128/334R	Absorbable collagen prosthetic implant with non-absorbable reinforcing strands
<u>3276448</u>	October, 1966	Kronenthal	128/334R	Collagen coated fabric prosthesis
<u>3463158</u>	August, 1969	Schmitt et al.	128/334R	POLYGLYCOLIC ACID PROSTHETIC DEVICES
<u>3526906</u>	September, 1970	De Laszlo	128/92C	PROSTHETIC IMPLANTS MADE FROM CARBONACEOUS MATERIALS
<u>3738906</u>	June, 1973	Olcott	3/1	PYROLYTIC GRAPHITE-SILICON CARBIDE MICROCOMPOSITES
		Schmitt et		POLYGLYCOLIC

<u>3739773</u>	June, 1973	al.	128/334R	ACID PROSTHETIC DEVICES
<u>3797499</u>	March, 1974	Schneider	128/334R	POLYLACTIDE FABRIC GRAPHS FOR SURGICAL IMPLANTATION
<u>3883901</u>	May, 1975	Coguard et al.	3/1	Method of replacing or repairing the body with bioresorbable surgical articles
<u>3893196</u>	July, 1975	Hochman	3/191	Body implant material
<u>3971670</u>	July, 1976	Homsy	3/1	Implantable structure and method of making same
<u>3992725</u>	November, 1976	Homsy	3/1	Implantable material and appliances and method of stabilizing body implants
<u>4118532</u>	October, 1978	Homsy	3/1	Implantable material and method of preparing same
<u>4127902</u>	December, 1978	Homsy	3/1	Structure suitable for in vivo implantation
<u>4329743</u>	May, 1982	Alexander et al.	3/1	Bio-absorbable composite tissue scaffold

## Foreign References:

BE679726 April, 1966

## Other References:

Wolter et al., "Ligament Replacement in the Knee Joint with Carbon Fibers Coated with Pyrolytic Carbon", Trans. 3rd Ann. Mtg. Soc. for Biomat., p. 126, 1977.

Cutright et al., "Tissue Reaction to the Biodegradable Polylactic Acid Suture", Oral Surgery, 31:134-139, 1/71.

Alexander et al., "Carbon-Polymer Composites for Tendon and Ligament Replacement", Trans. 4th Ann. Mtg. Soc. for Biomat., 123, 1978.

Kulkarni et al., "Polylactic Acid for Surgical Implants", Arch. Surg., vol. 93, pp. 839-843, Nov. 1966.

Jenkins et al., "Induction of Tendon and Ligament Formation by Carbon Implants", The Journal of Bone and Joint Surgery, vol. 593, pp. 53-57, 2/77.

## Primary Examiner:

Crowder, Clifford D.

## Attorney, Agent or Firm:

Clarke, Dennis P.

## Parent Case Data:

This application is a continuing application Ser. No. 033,945, filed Apr. 27, 1979 now U.S. Pat. No. 4,329,743.

Claims:

We claim:

1. A bio-compatible composition suitable for fabricating a non-migratory surgical article for the repair or replacement of ligament or tendon fibrous tissue of a human or non-human animal comprising a substrate of a plurality of carbon fibers completely enveloped by a bio-absorbable and bio-compatible polymer wherein the longitudinal axes of said carbon fibers are oriented in substantially the same direction and wherein said fibers provide a scaffold which promotes the growth of new fibrous tissue which is oriented substantially parallel to the longitudinal axes of said carbon fibers.
2. The composition of claim 1, wherein each of said fibers has a diameter in the range of from about 5 to about 15 microns.
3. The composition of claim 1, wherein each of said carbon fibers has a diameter of about 10 microns.
4. The composition of claim 1, wherein the said composite contains from about 30 to about 90%, by weight, of carbon fibers.
5. The composition of claim 1, wherein the said composite contains about 80%, by weight, of carbon fibers.
6. The composition of claim 1, wherein the said composite contains about 50%, by weight, of carbon fibers.
7. The composition of claim 1, wherein said at least one substrate comprises a substantially uniplanar layer of carbon fibers.
8. The composition of claim 7, wherein said composite comprises a plurality of said uniplanar layers in a stacked relationship, each of said layers being separated from the next adjacent layer by a layer of bio-absorbable polymer.
9. The composition of claim 1, wherein said polymer is selected from the group consisting of collagen and polyglycolic acid.
10. A bio-compatible non-migratory surgical article suitable for incorporation in the body of a human or non-human animal for the repair or replacement of ligament or tendon fibrous tissue thereof, said article constructed of a composite of at least one substrate of a plurality of carbon fibers completely enveloped by a bio-absorbable and bio-compatible polymer wherein the longitudinal axes of said carbon fibers are oriented in substantially the same direction and wherein said fibers provide a scaffold which promotes the growth of new fibrous tissue which is oriented

substantially parallel to the longitudinal axes of said carbon fibers.

11. The article of claim 10, wherein each of said carbon fibers has a diameter in the range of from about 5 to about 15 microns.

12. The article of claim 11, wherein said polymer is selected from the group consisting of collagen and polyglycolic acid.

13. The article of claim 10, wherein each of said carbon fibers has a diameter of about 10 microns.

14. The article of claim 10, wherein the said composite contains from about 30 to about 90%, by weight, of carbon fibers.

15. The article of claim 10, wherein the said composite contains about 80%, by weight, of carbon fibers.

16. The composition of claim 10, wherein the said composite contains about 50%, by weight, of carbon fibers.

17. The article of claim 10, wherein said at least one substrate comprises a substantially uniplanar layer of carbon fibers.

#### Description:

#### BACKGROUND OF THE INVENTION

The treatment of injured ligaments and tendons remains a serious clinical problem. Inadequately repaired damage to these structures results in pain, loss of function, and in some cases, subsequent degenerative arthritis. When severely damaged by trauma or disease, fibrous tissue repair is often impossible. Many researchers have suggested the use of replacement structures for such damaged tissue. At this time, however, a completely successful prosthesis for use in a chronic implantation has not been developed.

Difficult fractures of the long bones often require an internal fixation device to maintain stability and alignment during healing. A rigid metallic plate is usually the device of choice, although, ideally, the stiffness of the plate should vary over the course of treatment. During early healing, rigid fixation by plating promotes primary osseous union. Unfortunately, as the healing progresses, a rigid plate can cause cortical bone to atrophy. This stress protection atrophy results in loss of bone mass and remodeling of cortical bone to incompletely mineralized bone. Nor is the remodeling confined to bone directly beneath the plate. It can be observed to a lesser extent in the cortex opposite the plate. The long term result of stress protection is a mechanically inferior bony structure in the region of the plate. Upon removal of the plate, refracture is often a possibility thereby requiring protection and limited activity until sufficient bone strength can be regained.

The use of intermediately stiff plating devices has also been proposed. This compromise solution results in some loss of initial stability with the attendant possibility of non-union. In return there is some long term reduction in stress protection atrophy.

Ideally, the bone fixation plate should be sufficiently strong to promote osseous union at the fracture site and sufficiently flexible to allow at least partial load transference to the fractured bone inasmuch as some loading enhances the healing process.

With respect to the repair of damaged ligaments and tendons it has recently been demonstrated by Jenkins et al, "Induction of Tendon and Ligament Formation by Carbon Implants", J. Bone and Joint Surg., 59-B:53-57, 1977, and Wolter et al, "Ligament Replacement in the Knee Joint with Carbon Fibers Coated with Pyrolytic Carbon", Trans. 3rd Ann. Mtg., Soc. for Biomat., 126, 1977, that ligaments and tendons can be replaced by filamentous carbon implants. New fibrous tissue grows and is gradually aligned, replacing the carbon scaffold which fractures and degrades mechanically.

Alexander et al, "Carbon-Polymer Composites for Tendon and Ligament Replacement", Trans. 4th Ann. Mtg., Soc. for Biomat., 123, 1978, have indicated the need for physically protecting the delicate carbon fibers to avoid difficulty in implantation, premature fracturing in vivo and migration of carbon fibers from the site of surgery.

Kulkarni et al, "Polylactic Acid for Surgical Implant", Arch. Surg., 93, 839-843, 1966, and Cutright et al, "Tissue Reaction to the Biodegradable Polylactic Acid Suture", Oral Surg., 31: 134-139, 1971, have demonstrated the biocompatibility, biodegradability and ease of manufacture of surgical appliances of polylactic acid polymers.

U.S. Pat. Nos. 4,127,902 and 3,971,670 describe structures for in vivo implantation as substitutes for ligaments and tendons comprising a bio-compatible film, a bio-compatible fabric having a weave with no permanent yield in one direction integral with the film and a bio-compatible porous material which promotes the ingrowth of living tissue. The structure is used as a patch for repairing damaged ligaments and tendons and is designed to promote the growth of new ligament and tendon tissue. The patch, however, is intended for permanent implantation to the host animal.

U.S. Pat. No. 3,276,448 discloses the concept of coating a non-absorbable fiber-containing fabric intended for use as a repair structure for damaged tissue with collagen. The collagen is said to serve as a stimulus for new tissue growth in the area of repair.

It has been proposed in U.S. Pat. No. 3,992,725 to utilize carbon fibers as in vivo implantation material due to its ability to foster new tissue growth by virtue of its bio-compatibility. The patent proposes to combine the carbon fibers with polytetrafluoroethylene bonding material to provide a relatively permanent implant material.

U.S. Pat. No. 3,463,158 discloses the use of composites of polyglycolic acid and non-absorbable fibrous material as implants for tissue repair or replacement. The composition is designed such that new tissue growth surrounds the non-absorbable fibrous material.

U.S. Pat. No. 3,893,196 describes a material for fabricating a prosthesis comprising graphite fibers embedded in a coating with a medically inert plastic.

U.S. Pat. No. 3,272,204 discloses an absorbable collagen prosthetic implant reinforced with strands of non-absorbable material.

As is apparent from the aforesaid references, the use of filamentous carbon as an implant material is not unique. Indeed, it has been demonstrated that new fibrous tissue growth is encouraged by the carbon filaments, with the new tissue gradually aligning and replacing the carbon scaffold which fractures and degrades mechanically. However, filamentous carbon is usually produced on a polymer base, often with the addition of polymer sizing agents. These polymers frequently exhibit adverse tissue reactions or are carcinogens; as is polyacrylonitrile, a commonly used base material. It has been suggested to remove the sizing agent with methyl ethyl ketone possibly leaving trace polymer material behind. Complete removal of the sizing and base residue by heating to 4000° F. results in a strong material that is, unfortunately, brittle and sensitive to shear and bending deformations.

In addition, unprotected carbon has been found to break up during implantation and migrate from its implantation area. In some cases, it forms sinus tracks right through the skin.

The mere mechanical reinforcement of the carbon fibers with other materials does not satisfactorily eliminate the migration problem.

It is an object of the invention to provide a composition, surgical article and method for the fabrication of the surgical article and a surgical method for repairing or replacing a part of the body of a human or non-human animal, wherein the said article promotes and provides a scaffold for the growth of new tissue but is substantially non-migratory and bio-absorbable.

## SUMMARY OF THE INVENTION

The invention comprises a bio-compatible composition suitable for constructing a surgical article for the repair or replacement of a part of the body of a human or non-human animal comprising a composite of a bio-absorbable polymer and at least one substrate of a plurality of carbon fibers.

The invention also comprises a bio-compatible surgical article suitable for incorporation in the body of a human or non-human animal for the repair or replacement of a part thereof wherein the article is constructed of the above-described composition.

The invention includes a method for the manufacture of the bio-compatible surgical article comprising:

- (a) providing at least one substrate of a plurality of carbon fibers;
- (b) coating said at least one substrate with a bio-absorbable polymer, and,
- (c) shaping said at least one substrate into a surgical article of suitable shape and size.

The invention also includes a surgical method for the repair or replacement of a part of the body of a human or non-human animal by incorporating therein the above-described surgical article.

## DETAILED DESCRIPTION OF THE INVENTION

Where the ultimate implant article is to be utilized for the repair or replacement of damaged tendons, ligaments or other fibrous tissue, the longitudinal axes of the carbon fibers are preferably oriented in substantially the same direction, i.e., parallel to the longitudinal axis of the fibrous tissue to be repaired or replaced in order to promote the proper orientation of the new fibrous tissue growth.

Where the article is to be used as, for example, a bone fixation plate the orientation of the carbon fibers is relatively unimportant, except from a strength standpoint, since the function of the carbon fibers is not to promote new fibrous tissue growth but to stabilize the bone.

It has been found that completely enveloping the carbon fiber scaffold with a bio-absorbable polymer effectively prevents the migration of the filamentous carbon after implantation. The bio-absorbable nature of the polymer prevents its interference with the new tissue growth promoting characteristics of the carbon fiber scaffold. The polymer functions as a mechanical reinforcer for the carbon fibers during tissue growth. In the case of fibrous tissue

repair, new fibrous tissue grows and orients itself along the longitudinal axes of the carbon fibers. In the case of bone repair the composite is of sufficient strength to stabilize the bone and promote osseous union. The surgical article may be designed such that the rate of absorption of the bio-absorbable polymer by the body substantially coincides with the rate of new tissue growth, thereby enabling a transference of load from the carbon fiber-polymer composite to the new tissue over extended periods of time. It has been found that this transference of load during tissue growth is essential to the health and stability of the new tissue.

Any suitable bio-compatible and absorbable polymer may be utilized in the composition, article and method of the invention. Suitable such polymers include polyglycolic acid, collagen and polylactic acid. Polylactic acid is particularly preferred. Polylactic acid biodegrades by undergoing hydrolytic de-esterification to lactic acid, a normal intermediate in the lactic acid cycle of carbohydrate metabolism. The polymer is a thermoplastic and can be dissolved readily in chloroform and other suitable solvent materials. Polylactic acid is capable of maintaining its mechanical integrity in vivo for up to nine months, depending upon its mass, thickness, etc.

Any of the readily available carbon fibers may be employed in the composition, article and method of the invention provided that its tensile strength ranges from about 1.5 to about 2.75 GPa; its tensile modulus ranges from about 100 to about 500 GPa; and its ultimate elongation from about 0.4 to about 3.0%. Carbon fibers having a diameter in the range of from about 5 to about 15 microns, preferably about 10 microns, are satisfactory for preparation of the implant materials. It is particularly preferred to fabricate the implantation composition and articles from continuous tows or bundles containing approximately 10,000 carbon fibers. Generally, the tows or bundles are arranged in any suitable shape or configuration and sprayed, coated or drawn through a solution of the bio-absorbable polymer such that the substrate is completely enveloped by the polymer upon drying.

Depending, of course, upon the ultimate use of the article prepared from the composite, the latter may contain from about 30 to about 90%, preferably about 80%, by weight, of carbon fibers for ligament and tendon replacement and preferably about 50%, by weight, for fracture fixation device. The composite may be considered as a carbon fiber substrate coated with the bio-absorbable polymer or as the bio-absorbable polymer filled with the carbon fibers.

It is essential for the repair or replacement of fibrous tissue that the longitudinal axes of the carbon fibers be oriented in substantially the same direction in order to ensure proper orientation of the new tissue growth upon implantation of the surgical article. For



example, it has been found that composites prepared from carbon fibers in mesh or random orientation form, while promoting new tissue growth, gives rise to new tissue which is improperly oriented and, therefore, unstable.

The substrate of carbon fibers may take any suitable shape or size, depending upon its intended surgical use. For repair of ligaments and tendons, each of the substrates generally comprises a substantially uniplanar layer of carbon fibers. Where the ultimate article is used for bone fixation, the substrate is generally shaped so as to engage flush substantial areas of the exterior surface of the fractured bone. For the fixation of the long bones of the body, the contact surface is generally the internal curved surface of the fixation element adapted to engage the convex exterior surface of the long bone.

In order to provide maximum strength and to ensure proper tissue growth and orientation, it is preferred to form the article from a plurality of the coated carbon fiber substrate layers in a stacked relationship, each of the layers being separated from the next adjacent layer by a coating of the bio-absorbable polymer. It will be understood also that where the article is to be utilized for the repair or replacement of fibrous tissue, the longitudinal axes of the carbon fibers in each layer are aligned in the same direction. The stacked configuration of composite elements can be heated to a temperature slightly above the melting or fusing point of the bio-absorbable polymer in order to fuse or weld the layers together and the composite cooled in order to form the unitary product.

Where the surgical article is intended for the replacement or repair of non-fibrous tissue such as in the fixation of fractured bones, the particular orientation of the carbon fibers is not critical with respect to the orientation of new tissue. However, the carbon fibers should be aligned so as to provide maximum strength in the final article.

Where the article comprises stacked layers of polymer coated fiber substrates, the longitudinal axes of the carbon fibers in each layer are oriented in the same direction and form an angle of from 0° to 45°, preferably 15°, with the longitudinal axes of the carbon fibers in the next adjacent layer in order to provide maximum strength in the final article.

The surgical article or implant material is then preferably cut from the thus stacked composite in the desired shape or configuration. It will be understood by those skilled in the art, however, that the surgical article may be formed in the desired shape and/or configuration in a suitable mold or other shaping zone.

As noted above, the composite layers for forming tendon and ligament replacement articles are generally uniplanar in shape

whereas those intended for bone fixation plates are generally designed so as to fit flush on the external surface of the fractured bone. The most preferred method for forming bone fixation plates is to stack the layers of composite material in a mold conforming to the bone surface to be treated and heating the assembly to a temperature above the melting point of the polymers to fuse the layers together. Upon cooling, the article is removed from the mold and cut and/or machined into the final desired shape.

Where the article is to be utilized as a bone fixation plate, it may be provided with apertures for bio-compatible screws or other securing means for affixing the plate to the fracture bone surface.

The implant articles may be incorporated in the body of human and non-human animals according to standard and well-known techniques. For example, where the article comprises a bone fixation plate, the plate is affixed to the fractured bone utilizing screws or other securing means according to standard surgical techniques. Where the article comprises a replacement tendon or ligament, the article is affixed to the damaged ligament or tendon according to standard procedures. For example, in repairing damaged tendons, the replacement article may be threaded through a drill hole in the appropriate bone and secured to the appropriate area of the tendon to be repaired.

#### DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial fragmentary view of the human knee joint showing the total replacement of the patella tendon with the composite article of the invention;

FIG. 2 is an elevational view of a fractured long bone fixated with the composite article of the invention;

FIG. 3 is a greatly enlarged, exploded perspective view of a portion of a bone-fixation composite of a plurality of layers of polymer coated carbon fiber substrates;

FIG. 4 is a cross-sectional view taken along the line 4--4 of FIG. 3.

In FIG. 1 a polymer-carbon fiber composite is shown in the shape of a tendon 1 for the total replacement of a patella tendon in a human knee joint 3. The tendon replacement is affixed through drill holes 2 in the bone and by suturing through the soft tissue of the tendon.

In FIG. 2, a long bone B showing a fracture at 5 is stabilized with bone fixation plate 4 by securing the plate to the bone with screws 6. After osseous union at the fracture site and bio-absorption of the polymer, the screws may be surgically removed.

In FIGS. 3 and 4, each composite layer generally designated 8 of the exploded bone fixation plate contains a substrate of carbon fibers 12 enveloped by bio-compatible polymer 10. In stacked configuration, the longitudinal axes of the carbon fibers 12 form an angle of about 15° with the longitudinal axes of the fixation plate and 30° to the axes of the carbon fibers in the next adjacent layer.

#### EXAMPLE 1

A filamentous carbon fiber tow containing approximately 10,000 carbon fibers each having a thickness of about 10 microns were sprayed with a dilute chloroform solution of polylactic acid polymer to completely coat the fiber bundle. After drying, the coated substrates provided a replacement tendon structure suitable for repairing the patella tendon of adult Beagle dogs and white New Zealand rabbits. The patella tendon of one leg of each of the animals was removed and replaced by the polylactic acid polymer coated filamentous carbon composite articles which were threaded through a drill hole in the tibia and sutured through the quadriceps tendon above the patella.

The animals were left unprotected and allowed to freely move in their cages. Upon sacrifice at two months, the patella tendon replacement was freely movable, the carbon being contained and infiltrated within the developing fibrous tissue which was strongly attached to the bone and soft tissue. Histology on the replacement tissue indicated that the tissue was highly aligned in the direction of the carbon fibers showing evidence of good vascularity and mature tendon-like tissue formation.

After a period of four months, the animals had completely regained all function in the affected leg. There was no evidence of pain or walk with a limp. The ligament and tendon replacement provides mechanical strength upon implantation and allows ingrowth of new fibrous tissue, including bone attachment, with an increase in the transference of load to the new tissue as it develops.

#### EXAMPLE 2





An implant article suitable for use as a bone fixation plate was prepared according to the following procedure. A filamentous carbon fiber tow composed of approximately 10,000 carbon fibers each having a thickness of about 10 microns was wound on a cylindrical frame. The wound carbon fibers were spray coated with a chloroform solution of polylactic acid to provide a coated substrate comprising about 50%, by weight, of carbon fibers. Upon drying, the sheet of polymer coated carbon was removed and cut into the general elongate shape normally utilized as bone fixation plates. Twenty-four sheets of the coated carbon were stacked in a mold conforming to the shape of the fractured bone to be stabilized and molded into the appropriate bone fixation plate structure under

pressure and at a temperature above the melting point of the polylactic acid polymer. The sheets were stacked such that the longitudinal axes of the carbon fibers in each sheet formed an angle of about 30° with the axes of the carbon fibers in the next adjacent sheet. Upon cooling, the resulting fused composite of carbon fibers and polylactic acid were provided with apertures for receiving bio-compatible screws for affixing the plate to the fractured bone.

The femurs of several white New Zealand rabbits were osteotomized and plated utilizing the above-described composite plates according to standard and conventional techniques. The animals were sacrificed over periods of three weeks and six weeks and the femurs evaluated grossly and histologically.

Examination revealed that osteoporosis of the bone under the plate is avoided. Since the fixation plate loses rigidity due to the bio-absorption of the polymer as the bone regains its strength thereby transferring load to the healing bone, the resulting healed bone does not show the stress protection which occurs with the utilization of steel and other metal fixation plates.

Inasmuch as the plate system is partially absorbed by the body, it need not be removed as is the case with conventional metal plates.

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